## Remarks

Claims 1-17 remain in the application. Claims 18 and 19 have been newly added.

New claim 18 specifies that the upstanding features are not treated to give homeotropic alignment, as described in the specification, at least on page 14, lines 27-28. New claim 19 specifies that the liquid crystal molecules adjacent the cell wall surface between the upstanding features adopt an alignment which is planar or tilted planar as described in the specification at least in Figures 1-3 and 5-7, and on page 15, lines 11-13. Applicants have taken care to avoid adding new matter.

Claim 1 has been amended to clarify that the features are "upstanding." Claim 12 has been amended to be consistent with claim 1. Claim 11 has been amended to provide proper antecedent basis for the term "posts."

As such, claim 11 has been clarified by amendment for purposes of form. It is respectfully submitted that the amendment to claim 11 is neither narrowing nor made for substantial reasons related to patentablity as defined by the Court of Appeals for the Federal Circuit (CAFC) in Festo Corporation v. Shoketsu Kinzoku Kogyo Kabushiki Co., Ltd., 95-1066 (Fed. Cir. 2000). Therefore, the amendment to claim 11 does not create prosecution history estoppel and, as such, the doctrine of equivalents is available for all of the elements of claim 11.

Claims 1-17 were rejected under 35 USC §112, second paragraph, as being indefinite. The Office Action states that the phrase "a random or pseudorandom two dimensional array of features" is confusing because (1) the term "features" is not well defined; and (2) the term "random or pseudorandom" renders the claim indefinite. The Office Action questions whether "features" should be pixels or alignment domains or liquid crystal molecules.

The features are provided on the inner surface of a cell wall for the purpose of providing a desired alignment to liquid crystal molecules with which they are in contact. The features are upstanding from the cell wall and are shaped and/or orientated to

produce this desired alignment. Thus the features are not pixels or liquid crystal molecules, although a grouping of the features could be referred to as an alignment domain. Non-limiting examples of such upstanding features ore listed on page 7, lines 5 through 22. Applicants respectfully submit that what constitutes suitable "upstanding features" would be clear to one of ordinary skill in the art having regard to the teachings of the application.

The Office Action states that "random or pseudorandom" does not provide a standard for ascertaining the requisite degree of random, and that "pseudorandom" denotes a computational process which is not a practical or experimental process to manufacture a working device.

Addressing the last point first, reference is made to a definition of pseudorandom noise (copy enclosed) taken from the website of the Institute for Telecommunication Services, the research and engineering branch of NTIA, a part of the US Department of Commerce. Their Note 1 says "Although it seems to lack any definite pattern, pseudorandom noise contains a sequence of pulses that repeat themselves, albeit after a long time or a long sequence of pulses." In a similar manner, the features of the 2-D array of the present invention appear to lack any definite pattern when a single unit cell is considered (such as that illustrated in Figure 4). However, the pseudorandom array has a repeat distance of 56 μm, much greater than the wavelength of visible light. The pseudorandom array of the present Invention is mathematically analogous to pseudorandom noise. It is therefore submitted that "pseudorandom" is meaningful and practical in the context of the device of the present Invention.

Turning now to the degree of randomness: as is disclosed on page 6, lines 16-28, this may be selected to produce a desired optical effect independently of the LC orientation Induced by the shape and/or geometry of the alignment features. The features are not on a regular lattice (page 16, line 34) and may be effectively totally random (that is, the features lack any definite pattern and there is no unit cell). It is respectfully submitted that the term "random or pseudorandom" will be clear to one of ordinary skill in the art having regard to the teachings of the specification. Applicants therefore respectfully submit that no amendment is necessary with respect to this term.

In response to the objection to "microstructure" in claim 12, this claim has been amended for consistency with claim 1.

Claims 1, 2, 4-7, 9, and 12 were rejected under 35 USC §102(e) as being anticipated by Yamada et al. (US 6,067141A).

Claim 1 is directed to a liquid crystal device, including first and second cell walls enclosing a layer of liquid crystal material, and electrodes for applying an electric field across at least some of the liquid crystal material. Also included is a surface alignment structure on the inner surface of at least the first cell wall, providing a desired alignment to molecules of the liquid crystal material. The surface alignment structure comprises a random or pseudorandom two dimensional array of upstanding features which are at least one of shaped and orientated to produce the desired alignment.

Yamada et al. discloses liquid crystal molecules having negative dielectric anisotropy interposed between a pair of substrates. However, Yamada et al. fails to disclose a surface alignment structure on the inner surface of at least the first cell wall, providing a desired alignment to molecules of the liquid crystal material. In addition, Yamada et al. fails to disclose a surface alignment structure comprising a random or pseudorandom two dimensional array of upstanding features which are at least one of shaped and orientated to produce the desired alignment.

In the devices described with reference to Figures 10 and 12 of Yamada et al., a plurality of separate domains are produced by random seeding. In Figure 10, the liquid crystal material 207 is held between two opposed cell walls (201, 202). Each cell wall is provided with a non-rubbed polyimide alignment film. On cooling from the isotropic phase, the liquid crystal material aligns itself in planar domains, in each of which the nematic director has a single, randomly-determined direction. In Figure 12, vertical polymer walls are provided to separate the domains. In both Figure 10 and 12, because the polyimide film is not rubbed, it is effectively featureless. Therefore, Yamada cannot disclose or suggest a surface alignment structure comprising a random or pseudorandom two dimensional array of upstanding features. The polyimide walls of Figure 12 do not provide alignment but rather function to separate different domains.

Moreover, there is no desired alignment because it Is the purpose of Yamada to provide a display in which there are a sufficiently large number of randomly orientated domains as to provide a substantially symmetric viewing angle. The alignment of the director in anyone domain cannot be known in advance.

At least for these reasons, Applicants respectfully submit that claim 1 is not anticipated by Yamada et al.

Claims 2, 4-7, and 9 depend from claim 1 and therefore are also not anticipated by Yamada et al.

Claim 12 is directed to a cell wall for use in manufacturing a liquid crystal device. The cell wall includes a surface alignment structure on one surface thereof for aligning the director of a liquid crystal material, where the surface alignment structure includes one of a random or pseudorandom two dimensional array of upstanding features which are at least one of shaped and orientated to produce the desired alignment.

As mentioned above, Yamada et al. fails to disclose a surface alignment structure comprising a random or pseudorandom two dimensional array of upstanding features which are at least one of shaped and orientated to produce the desired alignment. Therefore, Applicants respectfully submit that Yamada et al. fails to anticipate claim 12.

Claim 3 was rejected under 35 USC §103(a) as being unpatentable over Yamada et al. in view of Hashimoto et al. (EP 0 768 560 A1).

Claim 3 depends from claim 1 and as such inherits all the features of claim 1. The combination of Yamada et al. and Hashimoto et al. fails to disclose a surface alignment structure comprising a random or pseudorandom two dimensional array of upstanding features which are at least one of shaped and orientated to produce the desired alignment. Therefore, claim 3 is patentable over the combination of Yamada et al. and Hashimoto et al.

Claims 8-11 and 15 were rejected under 35 USC 103(a) as being unpatentable Yamada et al. in view of Hirata et al. (US 5,872,611).

Claim 8 depends from claim 1 and recites that the features comprise posts which are tilted with respect to the normal to the plane of the first cell wall.

Hirata et al. relates to the use of different electrode spacings in a liquid crystal display. Bumps are provided on a cell wall surface for the purpose of locally reducing the electrode spacing. The bumps do not serve to align the liquid crystals and therefore are not shaped or orientated to produce a desired alignment. Thus, the bumps are not a random or pseudorandom two dimensional array of upstanding features which are at least one of shaped and orientated to produce the desired alignment. In fact, a separate, conventional alignment film 3a (Fig. 7) is provided on the bumps to effect alignment of the liquid crystal material. The alignment film is polyimide "processed for orientation". Thus Hirata teaches conventional alignment, and teaches away from Yamada, wherein multiple random alignments are employed. A person of ordinary skill in the art would therefore not combine Yamada et al. and Hirata et al. and, even if such combination were made, would not arrive at the subject matter of any of the present claims.

At least for this reason, Applicants respectfully submit that the combination of Yamada et al. and Hirata et al. fails to render claim 8 unpatentable.

Claims 9-11 and 15 depend from claim 1 and therefore are also patentable over the combination of Yamada et al. and Hirata et al.

Claims 13, 14, and 17 were rejected under 35 USC 103(a) as being unpatentable Yamada et al. in view of Enichen (US 5,552,611) and Foshaar et al. (US 6,236,445).

Claims 13, 14, and 17 depend from claim 12, and thus include a surface alignment structure on one surface for aligning the director of a liquid crystal material, which includes one of a random or pseudorandom two dimensional array of upstanding features which are at least one of shaped and orientated to produce the desired alignmen.t

As mentioned above, Yamada et al. has no disclosure related to such a surface alignment structure.

Enichen discloses an exposure mask for a charged particle beam projection system used in the manufacture of semiconductors, and a method of aligning such a mask. Enichen also has no disclosure related to an alignment structure for aligning the director of a liquid crystal material, which includes one of a random or pseudorandom two dimensional array of upstanding features which are at least one of shaped and orientated to produce the desired alignment. Furthermore, Enichen does not relate to liquid crystal displays and is in quite a different technical field. Enichen contains no teaching that would prompt a person of ordinary skill In the art of liquid crystal display manufacture to combine Enichen with Yamada et al. and Foschaar et al.

Foschaar et al. discloses a method of making topographic projections which may be used to test Integrated circuits and liquid crystal light valves. The projections are said to be of less than about 100 μm in diameter and in height and to be usable as spacers for liquid crystal displays. Like Yamada et al. and Enichen, Foschaar et al. has no disclosure related to an alignment structure for aligning the director of a liquid crystal material, which includes one of a random or pseudorandom two dimensional array of upstanding features which are at least one of shaped and orientated to produce the desired alignment. A person of ordinary skill in the art might use Foschaar to produce spacers to separate cell walls of liquid crystal displays, but combining Foschaar with Yamada would not lead the skilled person to the present invention because there would be no upstanding features which are shaped or orientated to produce a desired liquid crystal alignment. In the combination of Yamada et al., Enichen, and Foshaar et al., the liquid crystal display would adopt random domains precisely as is taught in Yamada and totally different from the present invention.

At least for these reasons, the combination of Yamada et al., Enichen, and Foshaar et al. fails to render claims 13, 14 and 17 unpatentable.

Claim 16 was rejected under 35 USC §103(a) as being unpatentable over Yamada et al. in view of Wakita et al. (US 5,574,593).

Claim 16 depends from claim 1, and recites that the inner surface of the second cell wall is treated to produce at least one of a locally planar or tilted planar alignment of the liquid crystal material, substantially at right angles to the alignment direction on the first cell wall, where the cell functions in an STN mode.

Wakita et al. discloses a liquid crystal display element having a laminated retardation film, that does not require a polarizer. However, like Yamada et al., Wakita et al. fails to disclose a surface alignment structure comprising a random or pseudorandom two dimensional array of upstanding features which are at least one of shaped and orientated to produce the desired alignment. Therefore, Applicants respectfully submit that the combination of Yamada et al. and Wakita et al. fails to render claim 16 unpatentable.

For these reasons, reconsideration of the rejected claims and withdrawal of the rejections is respectfully requested, as is allowance of all of the claims.

Attached hereto is a marked up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "Version With Markings to Show Changes Made."

Respectfully submitted,

4-3-02
Date

Paul D. Greeley
Attorney for Applicant(s)
Registration No. 31,019
Ohlandt, Greeley, Ruggiero & Perle, L.L.P.
One Landmark Square, 10th Floor
Stamford, CT 06901-2682
(203) 327-4500

Version With Markings to Show Changes Made

IN THE CLAIMS

1. (Twice amended) A liquid crystal device comprising a first cell wall and a second cell wall enclosing a layer of liquid crystal material;

electrodes for applying an electric field across at least some of the liquid crystal material; and

a surface alignment structure on the inner surface of at least the first cell wall providing a desired alignment to molecules of the liquid crystal ~~molecules~~material, wherein the said surface alignment structure comprises one of a random or pseudorandom two dimensional array of upstanding features which are at least one of shaped and orientated to produce the desired alignment.

11. (Amended) A device as claimed in claim 1, wherein said features comprise posts, and wherein a tilt angle and orientation of the posts are uniform throughout the device.

12. (Twice amended) A cell wall for use in manufacturing a liquid crystal device according to claim 1, comprising a wall and ~~an~~a surface alignment structure ~~surface microstructure~~ on one surface thereof for aligning the director of a liquid crystal material, said ~~microstructures~~surface alignment structure comprising one of a random or pseudorandom two dimensional array of upstanding features which are at least one of shaped and orientated to produce the desired alignment.

Please add the following new claims:

18. (Newly added) A liquid crystal device comprising:

a first cell wall and a second cell wall enclosing a layer of liquid crystal material;

electrodes for applying an electric field across at least some of the liquid crystal material;

a surface alignment structure on the inner surface of at least the first cell wall providing a desired alignment to the liquid crystal molecules, wherein the said surface alignment structure comprises one of a random or pseudorandom two dimensional array of upstanding features which are at least one of shaped and orientated to produce the desired alignment, and

wherein the said array of upstanding features is not treated to give homeotropic alignment.

19. (Newly added) A liquid crystal device comprising:

a first cell wall and a second cell wall enclosing a layer of liquid crystal material;

electrodes for applying an electric field across at least some of the liquid crystal material;

a surface alignment structure on the inner surface of at least the first cell wall providing a desired alignment to the liquid crystal molecules, wherein the said surface alignment structure comprises one of a random or pseudorandom two dimensional array of upstanding features which are at least one of shaped and orientated to produce the desired alignment, and

wherein liquid crystal molecules adjacent the cell wall surface between the said features adopt an alignment which is one of planar and tilted planar.